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U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

ANNUAL REPORT

JORNADA RANGE EXPERIMENT STATION

1927

R. S. Campbell and R. H. Canfield.

GOVERNMENT PRINTING OFFICE

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JORNADA RANGE EXPERIMENT STATION
ANNUAL REPORT AND PROGRAM OF INVESTIGATIONS
FOR 1927.

Administrative Features

Organization of Work

Although the purpose of every experiment station is research, yet a certain amount of administrative work must be carried. On account of the limited personnel, the administration of this station has at times curbed the experimental work, but it has been the general policy to accept opportunities of administrative extension only when they could be handled without undue interference with the research work.

Personnel

J. D. Schoeller, director, was detailed to the Washington Office on June 1, where he remained until September 8, working on the Jornada Carrying Capacity manuscript. On November 13, he was transferred from Research to Administration. He is now Assistant Supervisor in charge of grazing on the Plumas National Forest at Quincy, California. Research is losing an excellent man, but Schoeller's ability to apply in administration the methods and results he acquired on the Jornada will undoubtedly be of far-reaching benefit in District 5.

Upon Schoeller's transfer from the Jornada R. S. Campbell, who returned from eight months educational leave on May 25, was designated as Acting Director, with a rating of Assistant Range Examiner. It should be stated here that this recognition is deeply appreciated. With the excellent organization of the work which Schoeller left, the station should not be difficult to administrate until the new Director is appointed. It is planned for Campbell to take educational leave as soon as possible after the new Director arrives, in order to complete the work for his Doctor's degree.

R. H. Canfield, Junior Range Examiner, has been on the Jornada since his appointment June 25, 1926. During this time, he has become well acquainted with the work, and is now a highly valuable assistant. It seems quite obvious that with the limited personnel at the Station, it is essential to keep for as long as possible, experienced men who are familiar with the work, and who can not be easily replaced.

Frank Brown of Las Cruces was employed at various times through the year, both as temporary field assistant, and as temporary stenographer. In view of the increased accomplishment made possible by the small stenographic and clerical allotment this year, it is sincerely recommended that the funds for temporary stenographic help and temporary labor be materially increased for the coming fiscal year. Such an increase would relieve the permanent men of a large amount of office routine and maintenance details, and result in a marked increase in volume of work.

The future director of the Reserve should be a man of considerable experience in directing range research, and in preparing results for publication. The Station now has 12 years' results, the thorough analysis of which will be completed this year. In

order to provide a sound and thoroughly technical basis for the analysis of results and continuation of the experimental work, the requirements of the directorship practically demand an individual in the $3800.00 grade. It is hardly necessary to add that it is highly desirable for the new director to report as soon as possible after the beginning of the new fiscal year 1929.

Detail of Administrative Men

For the last year or more there has been considerable agitation for the detail of two or three administrative men to the Jornada for a period of three weeks to two months. The need is quite obvious, since there is always more work than the Station personnel can handle. Such action would bring outside ideas to the experimental work, and speed up accomplishment. The direct benefit to the District would be in having a few of its men each year in intimate contact with grazing research methods and results.

The note in D-3 Daily Bulletin of November 1, "What the 'Coronado bunch' got out of the Grazing Reconnaissance Assignment", shows the results

of a short training detail. If the results from such an assignment are so outstanding and desirable, then why not extend the policy to the Experiment Stations, where a broader field is covered and where the detail of men would be acceptable at any season of the year, although the summer or fall would be preferable.

Visitors

A large number of technical workers have visited the Jornada during the year. W. R. Chapline, in charge of Range Investigation, spent a little over two weeks in going over the projects and cooperative agreement, and in reviewing Scheeller's Carrying Capacity Manuscript. It was quite evident to everyone concerned that this inspection trip was entirely too short. A longer stay of the inspecting officer would permit a more adequate consideration of the Station plans, methods of field work and analysis of data. From past experience it is now felt that if the analysis of data can be kept up currently, much more effective results will be obtained.

During Mr. Chapline's stay, the Station was honored by a short visit from Drs. Frederick E. and Mrs. Clements of the Carnegie Institute, B. C. Tharp of the University of Texas, and Walter P. Taylor of the Biological Survey. This group was particularly interested in the vegetative work on the Jornada, their purpose being to coordinate the research on the Jornada with other ecological work in the Southwest.

Dr. R. R. Staples with his wife and Dr. A. E. Rosyn, of the Department of Agriculture, Union of South Africa, were visitors in the early part of September. They were interested in the organization of the work as well as methods and results. Dr. Staples thought the Reserve and surrounding country presented conditions more similar to the central part of the Union than any he had visited.

Matt J. Culley, Director of the Santa Rita Range Reserve, put in two days in January on the Jornada, going over projects in the field and discussing matters more or less common to both Reserves.

A. C. Cooley of the Extension Service and Byron Hunter of the Bureau of Agricultural Economics spent a day at the Station early in February, looking over certain of the projects and securing data on range conditions in this locality.

Two members of the Biological Survey made visits during the spring: Mr. A. E. Gray, whose chief interest is in rodent and predatory animal eradication; and J. Stockly Ligon, who inspected portions of the Reserve in search of Mountain sheep, with a view to creating a special reserve for these

animals.

The Range Management class from the New Mexico A. & M. College, under the direction of Prof. C. P. Wilson, spent the better part of two days at the Station. The class was taken in hand by the Jornada personnel and instructed in methods used in Range Investigations, Reconnaissance, Handling Stock, and the determination of Carrying Capacity as applied to Southwestern ranges.

Herman Krauch and Bert Lexen of the Southwestern Forest Experiment Station, stopped for a day and participated in inspection and discussion of some of the experimental work.

Marshal J. Chambers of the U. S. Weather Bureau made his annual inspection of the Station weather records and instruments in September.

The number of technical and research visitors by far outnumbered the administrative visitors to the Reserve this year. Will. C. Barnes, Assistant Forester, chief of grazing, made a visit to the Reserve in June. He was quite enthusiastic about the excellent range conditions in this locality.

J. L. Lantow of the New Mexico Agricultural College Animal Husbandry Department, made several visits to the Station in connection with the purchase of fifty-two selected heifers for the College Ranch, which adjoins the Reserve.

In February, Assistant District Forester John D. Jones delivered an excellent talk on Forestry at the Las Cruces High School and showed several reels of Forest Service pictures to the High School students. It is hoped that more of this Public Relations work will be available for Las Cruces audiences in the near future.

In view of the great number of technical workers in contrast to the few administrative men who visited the Station during the year, a striking need appears; namely, for more administrative officers to visit the Reserve. Every man in the District should know the experimental work, at least in its general phases; the station personnel hope to be of material aid in this by a constant series of news items in the D-3 Daily Bulletin. The District office men, in their highly administrative capacity, need especially to be in close contact with all of the Research activities in the District.

In order to bring about this desired contact between Research and Administration, it is planned to have a field day at the Jornada once every two years in cooperation with District Three and the New Mexico Extension Service.

Cooperation

Range Improvements and restocking in accordance with the terms of the Cooperative Agreement.

Improvements Complete Dec. 2. 1927.

Of the range improvements due for installation by December 2, 1927, the following were completed on that date:

Twelve and a half miles of new fence around Pastures 5, 7, 8, and 10.

Temporary rebuilding of approximately twenty-two miles of fences on other pastures of the Reserve.

Storage Tanks and tubs for stock water at Stuart Well, South Well and Headquarters.

Domestic Supply Tank at Headquarters.

Improvements not completed:

Of the range improvements due for installation by December 2, 1927, the following were not completed by that date:

Rebuilding of North and West Boundary fences, and a considerable mileage of division fences.

Rebuilding Pasture 3 fence.

Rebuilding Pasture 9, Bull Pasture fence.

Building Block Mountain fence.

Drinking tubs at Middle Well.

Storage tanks and tubs at Red Lake, West Well, Taylor Well, and Goldenburg.

Rebuilding of the pipe line from Goldenburg to Word Tank.

Rebuilding of Telephone line.

Installation of cattle guards and iron gates.

Owing to the many handicaps under which he has been working, it has been recommended that the cooperator be granted an extension of six months to complete the Bull Pasture, Red Lake, and Taylor Wells, and one year for the completion of the remaining items due December 2, 1927.

Restocking

The Cooperator has at present approximately 600 head in the breeding herd on the Reserve. This total was reached by the purchase of 200 cows during the summer. About 700 cows will be added to the breeding herd in the near future.

It is planned for the future, with a combination of up to date range improvements, adequate water storage, and conservative stocking, to make the Reserve a consistently paying proposition, and especially avoid loss of stock and money during drought.

Station Improvements and Equipment

Road Work

In cooperation with Dona Ana County, eight miles of road were graded at a cost to the government of $196.00. It is planned to continue this work with Cooperative Funds as soon as the County is ready to renew activities. The present graded road is especially in need of gravel dips where deep washouts have occurred. A drag is being constructed by the Station personnel for use in road maintenance. It would save considerable time and money in the operation of the Jornada if the District Office could in some way aid in financing the reconstruction of roads over the Reserve, during the coming fiscal year, if possible.

Office and Living Quarters

An adobe stucco bathroom was added to the office building, built by contract. A new telephone was installed in the office, and new window shades were purchased for all the government buildings. A new roof was placed on the old sleeping porch of the Dwelling House, in order to avoid the leaks which had developed in the old roof.

The work shop was painted, and a grain bin was built to prevent the wastage of oats which had taken place for some time.

In the way of equipment, a magazine rack was built for the office. Several tools and two excellent microscopes were transferred to the Station from the Veterans' Bureau.

Needs

During the coming year, the Dwelling House, garages, and work shop should all be painted, and the office building should be re-plastered.

A very important need of the Station is a new office building and laboratory, in order to relieve the crowded condition in the present office and permit more convenient accomodations for temporary employees. In connection with the proposed office, an electric lighting unit would be a most desirable feature. A fire-proof safe, for the proper protection of valuable records is very urgent; and all of the government buildings should be provided with fire extinguishers, as the Station has no fire protection equipment.

Other office and laboratory needs are a comptometer, which would permit a marked saving of time in computation; a complete set of weather instruments, to insure adequate climatological data; and other laboratory supplies such as an accurate

set of balances, and instruments for experiments with soils, evaporation, and seed germination.

The greatest use of most of the foregoing articles would depend on increased personnel, but practically all of it is in demand now.

For the satisfactory accomplishment of field work, a set of survey instruments is needed, including a Dumpy or similar level, a transit, rod, and chain. The pantograph must be rebuilt or a new one purchased soon, as the machine now in use is not up to standard accuracy, because of its poor state of repair.

The Station is badly in need of a new truck, since the old one is in such a bad state of repair as to hardly justify another overhauling. Moreover, the present car requires a great deal of attention for maintenance and upkeep, and as Mr. Haynie says, "is becoming no better fast." It may be stated that the government truck is the most important item of equipment in use on the Reserve, since it is the chief means of transportation in connection with nearly all of the projects.

Finance and Allotments--Fiscal Year 1928

The following funds were provided for the Jornada investigation for the Fiscal Year 1928:

Range Investigations	
Traveling expenses, Station improvements and maintenance	$ 1100.00
Stenographic and clerical	200.00
Salary, temporary assistant	700.00
Salary, Director	3200.00
Total	$ 5200.00
Salaries Forest Service--D-3	
Salary, Assistant	$ 1860.00
Cooperative Work--Forest Service	
Balance--Fiscal year 1927	182.00
Fiscal year 1928	400.00
Total	$ 582.00

Although the total provides for a slight increase over the Fiscal Year 1927, yet there are many station needs which must be neglected through lack of funds. At present, no great deficit for the current fiscal year is anticipated, but this results only from the balance left from the Director's salary after his transfer to District 5. However, any unforeseen expenses will produce a substantial deficit.

It is appropriate to express here the appre-

ciation due to the district office for handling the Station finances, and for the improvement money provided during the Fiscal Year 1927.

Estimated Expenditures Fiscal Year 1929

The needs of the Station have been presented under the discussions of Personnel and Station Improvement and Maintenance. In order to adequately provide for these needs, excepting the new office building, it is recommended that the following estimates for the Fiscal Year 1929 be favorably considered:

Personnel

	D-3	GE--RI
Director		$ 4000.00
Assistant (4 months, balance of time on educational leave.)		800.00
Second Assistant	$1920.00	
Part-time stenographer and clerk		600.00
Temporary labor		500.00

General Expense

New government Truck	700.00
Truck upkeep	300.00
Travel and field expenses	600.00
Station equipment	600.00

General Expense, [Cont'd]

	D-3	GE--RI
Miscellaneous Station expenses,		$ 250.00
Experimental Pasture and road construction	$ 700.00	
Totals	$ 2620.00	$ 8350.00

INVESTIGATIVE RESULTS

Climatic and Forage Conditions--1927

In spite of a late start, the precipitation for the growing season 1927 was considerably above average*, with the result that the excellent forage conditions of 1926 were extended to this year. These optimum conditions should be of considerable significance to the Forest officers and stockmen of this District.

The present status of the cattle industry in Southern New Mexico is unique in that the number of stock is low, the feed is excellent, producing fat stock, and top prices are being obtained in sales. This combination of favorable circumstances is conducive to an intense desire to restock on the part of most ranchmen.

The experimental work on the Jornada, however, has shown what should be the policy towards restocking at any time; namely, very conservative. This policy is substantiated by Schoeller in

* See distribution map of seasonal precipitation, Page 41.

his carrying capacity manuscript. For instance, he has found that during an extended drought period, the number of surface acres required to carry a cow yearlong may vary from 28.6% in the best years below the average as compared with 58.9% in the poorest years above the average. In other words, there is a greater fluctuation in carrying capacity in the poorest years as compared with the average for the period, than there is during the best years as compared with the same average. This goes to show that Forest officers and stockmen should not be misled by a couple of good years such as 1926 and 1927, and restock on the basis of a maximum grazing capacity. Because a series of two good years is the exception and not the rule, it seems a far wiser policy to graze not over 75% of the carrying capacity during good years, and be in a better position to meet the dry period bound to come, than to fully stock in good years and lose out during the drought. To repeat the point of the argument, stock conservatively at all times, particularly in good years.

It is well to note that this point has been stressed in District 3 by the District Forester's paragraph on October 7, and the Tusayan item of November 2 in the District Three Daily Bulletin.

Natural Revegetation Results and Their Meaning

The purpose of the natural revegetation project is to develop a system of grazing, based on the growth requirements of the principal forage plants, and to build up the range and maintain it through natural reseeding and revegetation.

The results of the project have been summarized in Departmental Bulletins 588, 745, and 1031. A new report "Natural Revegetation of Black Grama", which supplements the earlier results, is now in preparation by E. W. Nelson, former Director of the Station, and will be completed in manuscript form in Washington this winter.

The Range Forage Crop--Growth Requirements

The Range Forage Crop is grown mainly during the rainy summer season, and on account of the variable precipitation, spring feed is not to be depended upon. The perennial grasses then, constitute the largest part of the available feed, and their growth requirements constitute one of the dominating problems of natural revegetation.

At this Station, a great deal of work has been done with Black Grama, which is the predominant and most valuable grass in the locality.

This grass requires from five to seven weeks to mature, depending on the moisture conditions. Since there are practically no Black Grama seedlings, the revegetation is largely by the expansion of tufts, and by the development of stolons and sets. It appears that few runners produced are set during the same year, without a long growing season. This fact brings up the question of how closely the range may be used, and sufficient runners be left for natural revegetation. This question will be taken up after further consideration of growth requirements.

It has been found that the most rapid growth of Black Grama is on the sets, but in spite of this, on sandy soils, a large proportion of sets are pulled out by summer grazing. Therefore, wherever possible, Black Grama range should be reserved for winter feed.

There is a size limit reached by grama tufts. If very light use, or total protection is practiced, eventually such a heavy stand is developed during favorable years that it is unable to resist drought as well as a stand which has been properly grazed. In other words, proper grazing maintains the range better than total protection.

Of the other grasses which form a part of the forage crop, only three of the most important will be briefly discussed. Aristida is the first grass to initiate growth each year, and makes two growths if the precipitation is sufficient. The sand grasses (Sporobolus species) behave in a similar manner, except that they are slower in starting than Aristida. These two grasses have heavy seeding, particularly after the breaking down of a vegetative stand as a result of drought and overgrazing. Thus they play an important part in the plant succession which leads to a restoration of the perennial stand of vegetation after a period of retrogression. Tobosa grass starts growth slowly because it requires flooding. This plant reseeds poorly, but being a root stock grass, it can withstand heavy use in the summer, at which time it is most palatable and nutritious.

Now, the perennial grasses constitute the largest part of the available feed, and since their growth requirements must be met, they should not be used during any grazing year beyond the degree they can withstand and still make normal growth during the following season. The proper utilization should, of course, be based on the predominating valuable

species.

Two factors which must be considered in the proper use of a range unit are drought and wind action. It has been found that periodic drought may reduce the forage production fifty to sixty per cent, or even more, below the maximum. Therefore, ample allowance must be made at all times for the drought factor.

Wind action is accentuated during drought and overgrazing when there is less ground cover, and the soil is in a more loose condition. As is to be expected, the results of wind action are many fold. The most destructive is the erosion of soil away from plant roots, exposing the plant to death from lack of moisture. While the soil particles are in transit, there is undoubtedly considerable direct damage done to the vegetation by abrasion. Moreover, the windy season is a time of tremendous loss of soil moisture, because so much of the soil comes in contact with the air, and its moisture content is brought far below the wilting coefficient. Then a final detrimental force is exerted when the sand is deposited. Whole plants may be covered over, and a further loss occur. However, it seems that

plants recover more easily from sand deposition than from its erosion away from their roots.

In view of all the adverse factors with which the vegetation must contend, it then appears advisable that in the approximately average year, in any forage unit, but particularly winter range, the type should not be grazed up to the so called proper degree of utilization. Instead, there should be a reserve of feed on the type as a whole of twenty to twenty-five per cent of the forage volume. This policy produces reserve feed and prevents serious overstocking in dry years, besides leaving the vegetation in a more vigorous condition at the end of the drought.

Application of Results

The foregoing results are applicable to some 11,500,000 acres in Southern New Mexico, and considerable more in West Texas, parts of Northern New Mexico and even parts of Arizona, all chiefly valuable for the production of livestock.

Hardly any of this range is producing what it should because most of it is stocked on the assumption that the main feed is browse, or at least with browse as the final feed for the year after the grass is used. At the same time, grass should

be the chief forage, although in some instances, perennial grasses may constitute only five to ten per cent of the vegetative stand, and yetmay furnish as high as eighty per cent of the feed.

During past years, the public domain has been so badly depleted that the difference in the loss of grass density, particularly that of Black Grama, has not been recognized. This has led to the prevalent question among stockmen as to why the browse range will not carry the numbers of stock which it formerly did.

Because the cattle have had to graze somewhere, this public domain situation has exerted a continually increasing pressure on the National Forests. The stock have either drifted onto Forests, or at least increased the demand for Forest range. This pressure on the National Forests will be relieved only by improvement of the public domain, of which definite possibilities have been shown by investigations on the Jornada.

Therefore, every District Three Forest Officer should know not only the general results on the Jornada, but also the details of the Natural Revegetation. If grass can be maintained under the extreme climatic conditions at this Station, then the many principles developed here should

give a sound basis for the management of grama ranges, and even of other range types on the National Forests and public domain.

There is urgent need for more fundamental study of Black Grama, and an extension of work on a more intensive basis to other range types. However, this must be largely deferred until additional funds are made available.

What Carrying Capacity Should Mean to the Forest Administrators and Stockmen

Carrying Capacity is the foundation of all constructive range management. It deal s with two important factors, the range as a great natural resource, and the livestock business as a great and necessary industry. In the Southwest, the range, aside from watershed protection, is of little value except to the livestock industry and the livestock industry cannot survive without the range. Any practice that is detrimental to the range will in time harm the industry. For this reason the Forest Administrator and the Stockman have a common interest--the conservation of the range. This demands a clear comprehension and an intelligent application of carrying capacity principles.

Studies to determine the carrying capacity of Southwestern ranges have been carried on for a period of 12 years at the Jornada Range Reserve. From these studies it has been established that the carrying capacity of a range should be the basis of stocking that will give such a degree of utilization as will assure the range carrying a

sustained number of one or more classes of stock through a series of years.

Carrying capacity deals directly with that portion of the vegetation which may be removed annually by grazing animals over a series of years without reducing the stand of palatable plants.

The carrying capacity of a range is dependant on the forage crop, which is the annual volume production of palatable grasses, weeds and browse, normally eaten by stock. This forage crop should never be completely used. The degree of utilisation must conform to the palatability of the main forage species. Studies on the Jornada show that, on the Southwestern ranges, at least 20% of the palatable forage should be left untouched at the beginning of the new growing season. This question is discussed more fully on page 26 of this report.

The number of surface acres required per head per year, is not a sound basis for the determination of carrying capacity. The number of acres required per head fluctuates widely because of the

varying productivity of the range under prevailing growth conditions. On the Southwestern ranges, the amount and distribution of seasonal rainfall is the greatest controlling factor in forage production. In exceptional years the growing season may be as long as six months, while in other years it may be less than two months. Also the forage crop may vary as much as 60% between individual years, in accordance with the current growth conditions.

Carrying capacity studies conducted on the Jornada during a four year period of drought show the fluctuation in number of surface acres required per head year long to be as follows:

Summer-fall range from 77.3 to 158.9 surface acres.

Winter-spring range from 81.4 to 196.4 surface acres.

Mixed type yearlong range from 84.2 to 148.5 surface acres.

The change in carrying capacity of the range as indicated by the above figures was due to a loss in density of the main forage species and to a vari-

ation in the volume of the general forage crop. This variation was due in part to over-stocking and in part to drought.

The condition of a range is always reflected in the density, vigor, character, and volume of the forage. On most well managed ranges a large portion of the forage crop consists of strong, vigorous, palatable perennial plants. Exploited, impoverished ranges are characterized by a sparse production of palatable perennials which are low in vigor and have not the ability to compete successfully with the more hardy but less palatable vegetation.

Over-utilization during periods of drought quickly depauperates the range. As soon as the density of the stand is badly depleted the ground is exposed to erosion which impoverishes the soil. This condition is further augmented by deposition and trampling, both of which combined with erosion, reduce the productivity of the soil to a stage commonly referred to as overgrazed. Because of the sandy character of the soil in this region, which makes it very susceptible to such damage, great care must be used in stocking a range. A few years of

overstocking may not only result in a great loss of stock, but may also result in damage to the range that will impair its productivity and so reduce its carrying capacity for so many subsequent years as to be considered permanent.

The stockman should be educated to look upon the livestock industry as a permanent investment rather than a speculation. The range should be regarded as an integral part of his investment and should be stocked on a sustained yield basis. With conservative stocking and proper utilization of the range, wide fluctuation in numbers of stock would be eliminated.

With the wide fluctuation of numbers disposed of, smaller well-fed, high-grade, prolific herds which would produce a high percent calf crop would result. The increase in calf crop predicted, is borne out by nine years' data from Jornada experiments which show a 23.2% average increase over the general average for Southwestern New Mexico.

Conservative stocking would also alleviate the following evils caused by drought: The forced sale of stock when the cattle are in poor condition and the market unfavorable; the expen-

sive feeding of concentrate or the costly shipping of the herd to other ranges; high death loss and low calf crops, during and subsequent to, drought. These losses should be avoided instead of accepted as a part of the game.

The stockmen of the Southwest are now enjoying a wave of prosperity. They are beginning to long for the vast herds that once populated this region. They should be furnished with information which will result in the prevention of a repetition of the calamity from which they are now just beginning to recover. The vital factor in range conservation is carrying capacity. A knowledge of carrying capacity is so important that studies along this line should be enlarged and intensified as soon as additional funds and personnel become available.

Handling Stock

"Handling Stock on the Southwestern Ranges", involves the sum of a number of projects that have been carried on at the Jornada Range Reserve during a period of twelve years. The object of these studies is to develop a method of handling stock that will increase the productivity of the herd and conserve the range.

First, the character of the breeding herd is of prime importance. The Jornada herd is made up of high grade cows and pure bred Hereford bulls. The quality of the herd is maintained by a systematic culling of old bulls and old and barren cows. The size of the herd is maintained by selection of high grade heifers and by the purchase of young pure-bred bulls. In this manner the Jornada calf crop is made to top the market for this region. The bulls are segregated except in the breeding season. At this time they are distributed in a proportion of one bull to twenty cows. From June to the following December they remain with the cows. A special bull pasture is now under construction on some of the best grama grass range. This will eliminate

the necessity of feeding the bulls concentrates prior to the breeding season.

This method of management together with sufficient forage at all times for the entire herd has materially increased the calf crop. The calf crop of the Jornada holds a nine-year average of 74.1% as compared to 50.9% average estimated for the other ranges of this region during the same period. There is every reason to believe that the Jornada calf crop percent can still be increased and that like results can be had with the same management on similar ranges. The calves are weaned at approximately six months of age. No segregation at weaning time has been necessary because deliveries have been made on December 1 of the current year and February 1 of the following year.

A system of pastures has been developed that permits the utilization of the major range types at the time of their highest palatability. There are two summer-fall pastures in which Tobosa grass is the main forage species; two winter-spring pastures in which black grama is the main forage species; two mixed type yearlong pastures; and the mountain pasture which is held as a reserve range.

The pastures are watered by eleven wells, eleven springs and fourteen surface tanks. The wells that are of the greatest practical value are being equipped with steel storage tanks and drinking tubs.

Salting is accomplished by means of block salt in the immediate vicinity of the watering places. No attempt has been made to influence distribution of stock by salting as the stockmen of this region are not favorably disposed to salting away from water. Lack of time because of limited personnel precludes this project from being carried on in an active status.

Loss from starvation is believed to be eliminated by conservative stocking and the present method of pasture management. This region is practically free from stock diseases with the exception of black leg. This disease is readily prevented by vaccination at time of branding. The total death loss on the Jornada for a period of 10 years is slightly less than 2%, while on similar ranges the loss is estimated to be more than three times that percentage. In some instances the loss has been as high as 30% for one year by drought.

PLANS FOR THE FUTURE

Present Projects

The main work for the coming winter and spring is to be the analysis of current and back data from the present projects. It is necessary to complete this analysis, not only for publication, but also to give a thoroughly sound basis for the correction of deficiencies in the present methods and organization, and for the establishment of new studies.

Expansion of Work

The expansion of present experimental work must necessarily be quite conservative, yet the collection of an ever increasing amount of field data is most urgent, in order to place the natural revegetation and carrying capacity studies on a more fundamental basis, especially from an ecological standpoint. Suggestions for expansion of present projects will be found under the individual project statements.

All of the foregoing increase in work must be delayed until additional help is available, especially for compilation and analysis, so that there will be sufficient time for the preparation of manuscripts covering completed work.

Departmental Publications

"The Natural Revegetation of Black Grama", a manuscript prepared by E. W. Nelson, will be brought up to date by adding the analysis of data up to 1926 or 1927. Nelson will revise the manuscript in Washington this winter for publication as a Departmental Bulletin.

Schoeller's Carrying Capacity manuscript at present covers only four recent years' results. This paper will be revised by Chapline on the basis of ten years' data, and published as a Departmental Bulletin.

When time permits, the data from the clipping and the snakeweed studies will be thoroughly analyzed, with a view to preparing a preliminary presentation of results in a Journal of Agricultural Research article. Later when the collection and analysis of additional data show the need, the preliminary manuscript will be revised and published in complete form.

For some time, it has been realized that there is a need for a manuscript on the Forage Plants of the Jornada. Such a publication would

not only be of value to stockmen and extension agents on surrounding range, but would be invaluable to Station personnel in carrying capacity and associated projects, as well as in the reconnaissance which must soon be made of the Reserve. The material for such a manuscript has been in collection for many years, the herbarium is now well organized and up-to-date, and with this year's plant collection, the list of forage species should be very nearly complete. As soon as the present palatability studies are somewhat more advanced, the preparation of this paper should be started.

In order to issue a widespread "Warning of Caution" to all stock owners in the Southwest, the publication is contemplated of a six or eight page leaflet, which would embody the discussion of conservative stocking on pages 19-21 of this report. The policy recommended in the leaflet would be supported by sales data over a long period of years. If the paper were made a cooperative project between the Forest Service and the Markets Division of the Bureau of Agricultural

Economics, representing both the production and marketing phases of the industry, it would be a forceful and timely warning against the present tendency of hurried restocking. Such a paper would materially aid in averting a repetition of the overproduction which occurred in the past, and help to keep the livestock industry on a stable basis.

Other Presentation of Results

When sufficient data is collected and analyzed, articles of more popular nature, similar to Schoeller's "Cost of a Calf" in the October "Producer", will be written and submitted for publication in various livestock journals. It is also planned to continue the present policy of keeping the Station incidents before the Forest Officers and stockmen by a constant series of news items published in the Service Bulletin, the District Three Daily Bulletin, and the newspapers.

In order to keep the administrative Forest officers and local stockmen in touch with the Station findings, and to insure a continual stimulation to the experimental work from outside sources, it is planned to hold a field day every other

year for Forest Officers, stockmen, and other interested people. For the most far-reaching results, this field day would be most easily promoted in cooperation with District Three, and the New Mexico Agricultural Extension Service.

As soon as satisfactory arrangements can be completed, a quarterly meeting of the New Mexico Cattle and Horse Growers' Association will be held at the Reserve and at the Agricultural College Ranch, in cooperation with the New Mexico Agricultural Experiment Station.

RS
Artificial Reseeding

December 24, 1927

Project: The introduction of drought resistant herbaceous and tree species.

Scope: To test various exotic plants of all classes, with a view to finding species capable of resisting the climatic conditions on the Jornada and on similar range.

Status: The several species of grasses and weeds tested have largely proved failures, due to the arid climate of this region. Results to date included in progress reports.

A plot of Erodium cicutarium, California Filaree, planted in 1925, produced numerous small plants in the spring of 1927. Some of these plants flowered and produced seed. Plantings of Texas filaree made this spring gave no results. Wallaby grass (Danthonia Semiannularis) seeds, when planted under protection and irrigation, showed excellent viability, but the seedings failed to survive under natural Jornada conditions.

Seedlings of various drought resistant trees planted in 1923 have shown the following results:

Species	No. planted	No. living	% survival	Avg. Ht.	Avg. Ht. growth--1927
Chinese Pistache	53	2	3.8	13"	0
Chinese elm	175	14	8.0	*62"	3"
Evergreen Tamarisk	20	0			
Russian Mulberry**	2	0			

*Exclusive of one tree 180 inches high, grown over cesspool

** Planted in 1927.

The survival of even so few trees was made possible by regular irrigation in spring, summer and fall.

Further work:

No further work is contemplated until additional funds and personnel are available for this work.

Date of Completion:

Continuous

Assignment:

Jornada Range Experiment Station, Campbell and Canfield.

RG
Natural Revegetation

December 24, 1927

Project: Natural Revegetation of South Central New Mexico Range Types.

Scope: To develop a system or systems of grazing based upon the growth requirements of the principal forage plants, which will build up range land similar to that of the Jornada Range Experiment Station, by natural reseeding and revegetation, and maintain such ranges at their highest degree of productivity.

Status: Results from 1915 to 1919 published in U. S. D. A. Bulletins 588 and 1031. A report on the Natural Revegetation of Black Grama is in preparation by E. W. Nelson, former Director of the Station. Work Plan was revised this year by Schoeller.

Three new series of quadrats and additional plots in three old series were established this year in order to give more complete data on Mesquite-Sandhill, Grama-Creosote bush, Grama, and Tobosa types of range. Out of 200 quadrats established, in connection with Natural Revegetation and related projects, 140 were charted this year. The remaining 60 quadrats have either been abandoned, or are carried as inactive. The past 4 years' data have been compiled and analyzed by Schoeller for his Carrying Capacity manuscript. Important results based on ten years' data included in discussion on pages 22-28 of this report.

One new precipitation Station was added this year. The excellent precipitation for the Grazing Year 1926-27, and for the 1927 growing season (see accompanying maps) have resulted in consistent improvement of the range during the past two years. Nearly all perennial species show continued gains in density this year over last.

Livingston atmometers were run at four stations, during this years growing season, with very satisfactory results. The atmometers were furnished by the University of Chicago.

Further Work:

Project to be continued according to revised work plan. Data for 1926 and 1927 to be compiled and analyzed for progress report. Evaporation and soil moisture investigations to be carried as inactive until adequate personnel is available, to handle them.

Short publications concerning "Interesting Notes on Black Grama", and "The Vegetational Succession of the Mesquite-Sandhills" are planned for the coming year.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

SEASONAL PRECIPITATION
1927
JORNADA RANGE RESERVE.

Station	July	August	September	Total
Headquarters	1.32	2.32	2.52	6.16
Middle Well	0.30	1.22	1.89	3.41
Red Lake	0.87	2.84	2.52	6.23
Road Tank	1.87	2.61	2.97	7.45
Ropes	2.16	2.98	2.09	7.23
St. Nicholas	3.42	3.13	2.41	8.96
South Well	1.87	2.05	2.30	6.22
Stuart Well	2.17	2.74	2.66	7.57
Ragged Tank	2.00	2.79	1.98	6.77
West Well	4.10	1.52	2.69	8.31
Period Study	1.71	2.52	2.55	6.78
Enclosure # 1	1.79	1.99	2.71	6.49
Enclosure # 10	1.96	1.53	2.09	5.58
Number 2	2.72	2.17	2.71	7.60
Aristida Encl.	1.30	1.45	2.23	4.98
Brown Tank	2.30	1.77	3.51	7.58
Sand Hills	3.98	1.79	3.11	8.88
New Well	1.95	1.95	2.13	6.03
AVERAGE	2.10	2.18	2.50	6.79

Mean Seasonal Precipitation this locality— 4.70"

PRECIPITATION - JORNADA RANGE RESERVE

GRAZING YEAR 1927 AND SEASONAL CALENDAR YEAR 1927

	Calendar Year 1926						Calendar Year 1927								
Station	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total Ann.	Seas. 1926	Seas. 1927
Headquarters	4.95	0.38	3.20	2.32	0.04	1.62	0.02	0.25	0.47	T .53	0.00	0.08	13.33	8.53	6.16
Middle Well	3.21	0.06	3.24	2.23	0.04	1.97	0.02	0.03	0.58	0.00	0.06	0.03	11.44	7.51	5.41
Red Lake	1.85	0.42	2.55	1.75	0.02	1.94	0.02	0.05	0.62	0.00	0.00	0.02	9.22	4.82	6.23
Road Tank	5.19	0.22	3.91	2.37	0.06	1.78	0.02	0.21	0.84	0.00	0.00	0.37	14.97	9.32	7.45
Ropes	2.52	1.09	4.11	2.36	0.00	2.08	0.02	0.46	1.06	0.00	0.00	1.24	14.86	7.72	7.23
St. Nicholas	6.07	1.20	3.96	2.67	0.02	2.03	0.02	0.47	1.05	0.00	0.00	1.24	18.73,	11.23	8.96
South Well	4.01	0.25	3.48	2.61	0.01	1.84	0.03	0.34	0.51	0.00	0.00	0.10	13.18	7.74	6.22
Stuart Well	4.75	0.25	2.78	2.66	0.04	1.73	0.02	0.51,	0.55	0.00	0.00	0.02	13.31	7.78	7.57
Ragged Tank	6.30	1.16	2.78	2.24	0.00	1.31	0.02	0.41	0.48	0.00	0.00	0.22	14.92	10.24	6.77
West Well	2.48	1.66	4.81	2.53	0.12	2.03	0.02	0.23	0.25	0.00	0.00	0.04	14.17	8.95	8.31
Period Study	5.42	0.52	3.70	2.52	0.00	1.89	0.02	0.25	0.48	0.00	0.00	0.08	14.88	9.64	6.78
Enclosure # 1	4.00	0.25	3.64	2.35	0.00	2.05	0.02	0.30	0.45	0.00	0.00	0.08	13.14	7.89	6.49
Enclosure # 10	3.81	0.31	3.53	2.34	0.00	2.00	0.02	0.46	0.53	0.00	0.00	0.13	13.13	7.65	5.58
Number 2	2.11	0.47	4.16	2.43	0.01	1.78	0.02	0.29	0.28	0.00	0.00	0.03	11.58	6.74	7.60
Aristida Encl.	2.77	0.42	2.54	0.89	0.79	2.01	0.02	0.15	0.31	0.00	0.00	0.02	9.92	5.73	4.98
Brown Tank	5.76	0.04	3.21	2.30	0.03	1.36	0.02	0.29	0.63	0.00	0.00	0.17	13.80	9.01	7.58
Sand Hills	5.24	0.29	3.15	2.09	0.00	1.98	0.02	0.21	0.63	0.00	0.00	0.21	13.82	8.68	8.88
New Well	5.76	0.81	3.58	1.84	0.40	1.95	0.02	0.25	0.83	0.00	0.00	0.46	15.90	10.15	6.03
Avegage	4.23	0.60	3.46	2.25	0.09	1.85	0.02	0.29	0.58	0.00	0.00	0.25	13.57	8.24	6.79

Mean Seasonal Precipitation this locality--4.70"

LEGEND: SEASONAL RAINFALL, JULY - AUG. - SEPT. - 1927

STATION	PRECIPITATION INCHES		APPROX. AREA COVERED
Middle Well	3.41	3 - 4	
Jackson's Ranch	4.80	4 - 5	
Aristida Encl.	4.98	" "	
Enclosure # 10	5.58	5 - 6	
New Well	6.03	6 - 7	
Headquarters	6.16	" "	
South Well	6.22	" "	
Red Lake	6.23	" "	
Enclosure # 1	6.49	" "	
Ragged Tank	6.77	" "	
Period Study	6.78	" "	
Ropes	7.23	7 - 8	
Road Tank	7.45	" "	
Stuart Well	7.57	" "	
Brown Tank	7.58	" "	
Number 2	7.60	" "	
West Well	8.31	" "	
Sand Hills	8.88	" "	
St. Nicholas	8.96	" "	

Note Local character of the rain fall as shown by the variation in precipitation for the individual stations.

Mean Seasonal precipitation for this locality--4.79"

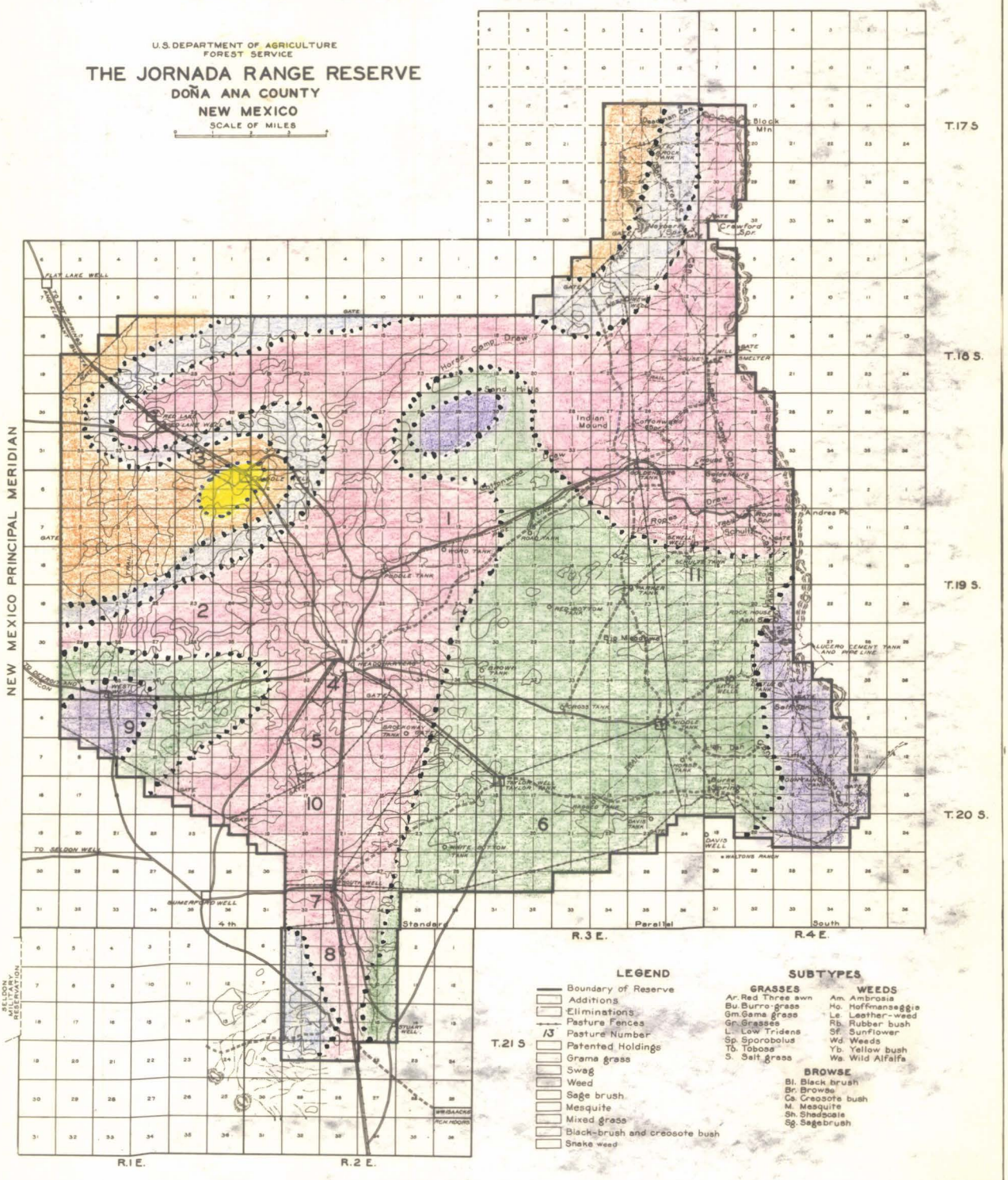
• Precipitation Stations.

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

THE JORNADA RANGE RESERVE

DOÑA ANA COUNTY
NEW MEXICO

SCALE OF MILES



LEGEND

- Boundary of Reserve
- Additions
- Eliminations
- Pasture Fences
- /3 Pasture Number
- Patented Holdings
- Grama grass
- Swag
- Weed
- Sage brush
- Mesquite
- Mixed grass
- Black-brush and creosote bush
- Snake weed

SUBTYPES

GRASSES

Ar. Red Three awn
Bu. Burro-grass
Gm. Game grass
Gr. Grasses
L. Low Tridens
Sp. Sporobolus
To. Tobosa
S. Salt grass

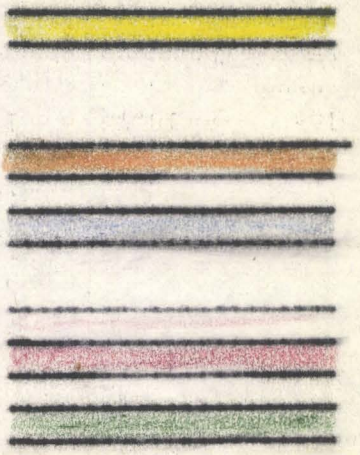
WEEDS

Am. Ambrosia
Ho. Hoffmanseggia
Le. Leather-weed
Rb. Rubber bush
Sf. Sunflower
Wd. Weeds
Yb. Yellow bush
We. Wild Alfalfa

BROWSE

Bl. Black brush
Br. Browse
Ca. Creosote bush
M. Mesquite
Sh. Shadscale
Sg. Sagebrush

LEGEND:	ANNUAL RAINFALL,	*GRAZING YEAR, 1927
STATION	PRECIPITATION INCHES	APPROX. AREA COVERED
Red Lake	9.22	9 - 10
Aristida Encl.	9.92	" "
- - - - - - - - - - - - - -		10 - 11
Middle Well	11.44	11 - 12
Number 2	11.58	" "
- - - - - - - - - - - - - -		12 - 13
Enclosure # 10	13.13	13 - 14
Enclosure # 1	13.14	" "
South Well	13.18	" "
Stuart Well	13.31	" "
Headquarters	13.33	" "
Brown Tank	13.80	" "
Sand Hills	13.82	" "
West Well	14.17	14 - 15
Ropes	14.86	" "
Period Study	14.88	" "
Ragged Tank	14.92	" "
Road Tank	14.97	" "
New Well	15.90	15 - 16
- - - - - - - - - - - - - -		16 - 17
- - - - - - - - - - - - - -		17 - 18
St. Nicholas	18.73	18 - 19



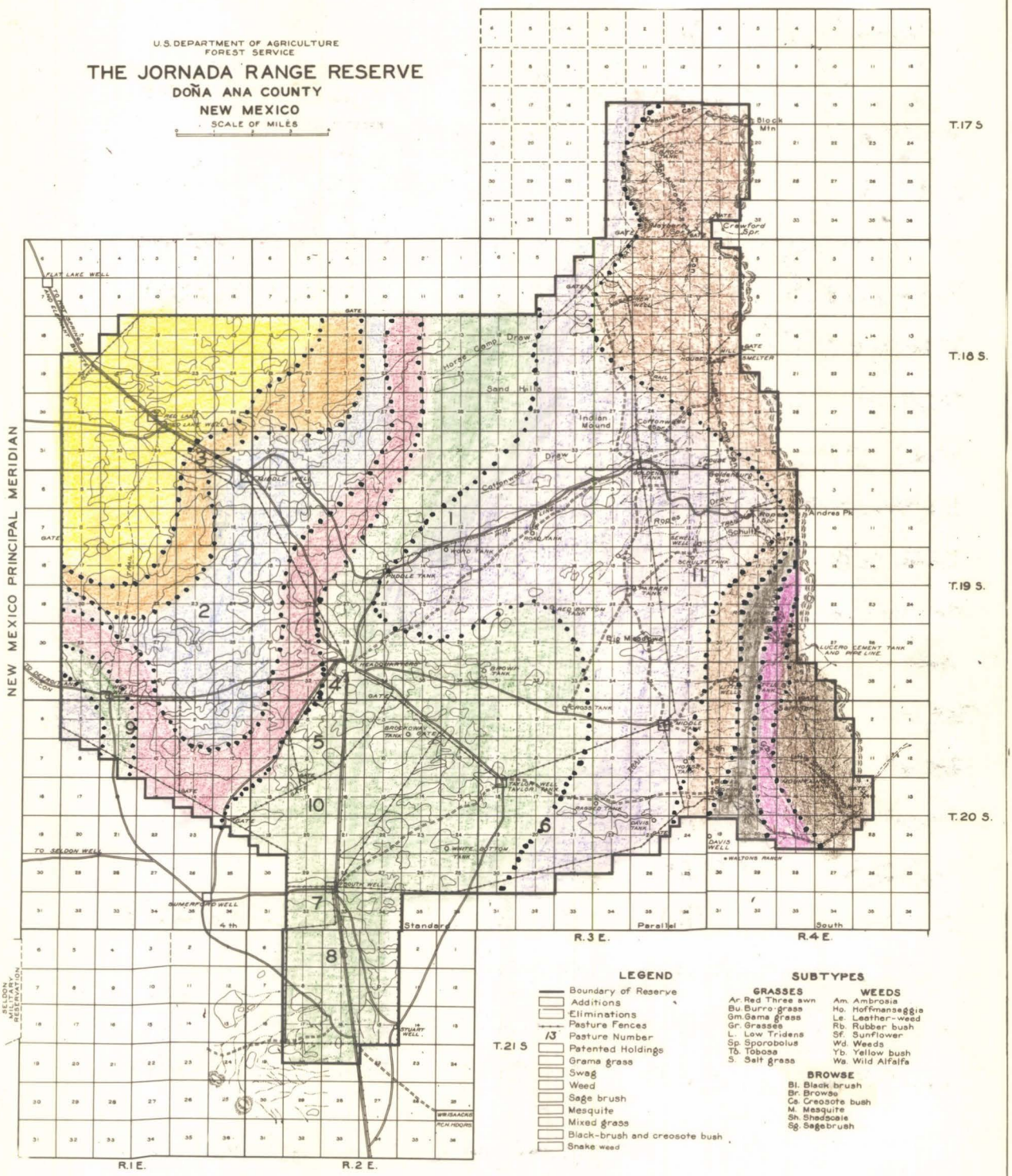
* Corresponds to Fiscal Year 1927

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

THE JORNADA RANGE RESERVE

DOÑA ANA COUNTY
NEW MEXICO

SCALE OF MILES



LEGEND

- Boundary of Reserve
- Additions
- Eliminations
- Pasture Fences
- 13 Pasture Number
- Patented Holdings
- Grama grass
- Swag
- Weed
- Sage brush
- Mesquite
- Mixed grass
- Black-brush and creosote bush
- Snake weed

SUBTYPES

GRASSES

Ar. Red Three awn
Bu. Burro-grass
Gm. Gama grass
Gr. Grasses
L. Low Tridens
Sp. Sporobolus
To. Tobosa
S. Salt grass

WEEDS

Am. Ambrosia
Ho. Hoffmanseggia
Le. Leather-weed
Rb. Rubber bush
Sf. Sunflower
Wd. Weeds
Yb. Yellow bush
Wa. Wild Alfalfa

BROWSE

Bl. Black brush
Br. Browse
Cs. Creosote bush
M. Mesquite
Sh. Shadscale
Sg. Sagebrush

RE
Unauthorized
Special Project
Natural Revegetation.

December 24, 1927

Project: Study of vegetative habits of Black grama, Bouteloua eriopoda.

Scope: To determine the growth habits and propogations methods of Black Grama.

Status: Project to be carried on during observer's leisure time. Work begun March 1927. At this time it was observed that the culms of Black grama remained alive through the winter, thus providing a supply of green forage through the winter months. Early in the spring all nodes up to and including the second node below the rachis produce a rosette of densely hairy leaves which are similar in arrangement to the parts of a bulb and which eventually, by elongation of the inner leaves, form "loose sets". These loose sets are located in the axis of the leaves of the previous season, which die and disintegrate as do the leaves and stems of other grasses. It was also observed that the culms of Black grama are solid --a characteristic that was found by investigation to be common to 76% of the Mesa grasses. Recent experiments conducted at the University of Chicago (Seed Germinations in Certain New Mexico Range Plants; Thesis, by Carola Viginia Jackson, 1927) no seeds of Black grama were found in any of the samples. Numerous observations made on the Jornada have given the same result. It appears to be quite improbable that in the absence of viable seed that Black grama could migrate th the isolated habitats that it occupies in many instances by its well known method of vegetative propogations--stolons and sets. IN search of an answer to this problem, experiments were conducted on the basis of a possible propagation by fragmentation.

In March, 1927, a large number of 1926 flower stalks were broken off and planted in a shallow pan and watered faithfully. No favorable results were obtained. In July this proceedure was repeated without success. A phytometer of 36 units was set up in July in which 30 specimens of small grama tufts were planted. These specimens were kicked out of the soil with the toe of the observer's shoe and most of the soil was shaken from the roots before transplanting. It was thought that a small tuft of grama might become detached from the soil by trampling or pulling occassioned by grazing animals and be transported far by the wind, where it might again take root and survive. Six of these specimens are now alive. Late in July, 24 well established young sets were pulled from the soil and planted. This batch survived 100%. Near the end of the growing season in September it was observed that many of the "loose sets" on upright flower stalks of the previous year had produced flower stalks which had completely headed out, thus giving the 1926 flower stalk a second crop of flowering heads.

While charting quadrats at the Black grama Clipping Study, Mr. Campbell discovered what appeared to be well-established Black grama seedlings. Subsequent examination showed these specimens to be identical in structure with the loose sets produced on the 1926 flower stalks. Previous charting shows that these specimens were new to the area. This phenomena will be carefully checked next season.

Further Work:

Study to be continued at every opportunity when it will not interfere with regular work in any way. Fragmentation theory to be carefully checked. Article to be prepared for publication.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Canfield.

RG
Period Study

December 24, 1927

Project: Period Study of Black Grama, (Bouteloua eriopoda.)

Scope: To determine the best seasonal use for Black Grama range in order to maintain this type at its highest productivity.

Status: Original project established in 1922, and results reported including 1925. Reestablished in field in spring of 1926. Six adjoining one acre barbed wire enclosures were opened during 1926 at intervals stated in working plan. Fourteen quadrats in connection charted each year. Growth and utilization data secured during the growing season. On account of the small numbers of cattle and the large pasture in which the study was established, the utilization has never been satisfactory. Therefore, the study has been practically inactive this year, although about 15% utilization was obtained in March, when salt was placed at the study, and removed from the nearest watering place. No results to date.

Further Work:

Study to be conducted as partially inactive until sufficient cattle are placed in Pasture No. 1 yearlong to give proper utilization at the Period Study.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Clipping Study
Tobosa Grass

December 24, 1927

Project: Clipping Study of Tobosa Grass (Hilaria mutica.)

Scope: To determine by artificial methods, the effect of different intensities of use on forage production and maintenance of density, height growth, volume production, and plant vigor. To check results obtained from these methods with regard to seasonal use and degree of use against prior determinations.

Status: Project established in field in May, 1925. Precipitation station established. Two series of four quadrats laid out for a comparison of close with moderate utilization. All plots clipped at specified intervals during past three growing seasons and record kept of air-dry weight of forage cut. Quadrats charted when established and at close of each growing season. Flower stalk and leaf measurements secured.

The data to date indicate that persistent close grazing increases the number of flower stalks produced, but eventually reduces the density except in very favorable years and reduces the amount of forage produced per unit of tuft area. Moderate grazing as simulated by clipping the "A" series to four inches above the ground shows a like stimulation of flower stalk production, but the density increase after the first year is not so dependant on climatic conditions. In 1927, with a short period of growth, quadrats 1, 2, 3, and 4 show a decrease in density, while the "A" series show a comparatively large increase in tuft area. The "A" series also show a favorable production of forage

during 1927 as compared to 1926 which had a much longer growing season. The accompanying table gives a summary of data for the individual quadrats over the three year period that the study has been in progress.

Further Work:

The study to be continued as outlined in work plan. An analysis of all data to be accomplished during the coming year.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

TOBOSA CLIPPING STUDY--SUMMARY OF DATA

Year	Quadrat No.	1	2	3	4	1A	2A	3A	4A	5	
	Clipping Intervals	1 wk.	2 wks.	4 wks.	end of seas.	1 wk.	2 wks.	4 wks.	end of seas.		
	Height of Clipping	2"	2"	2"	2"	4"	4"	4"	4"		
1925	Actual Tuft Area--Sq. dcms.	16.97	14.84	11.80	11.61	17.76	13.26	12.42	11.61		
1926	" " " " "	35.92	31.58	31.56	27.02	32.99	29.53	31.66	29.35	26.95	
1926	Gain--Sq. dcms.	18.95	16.74	19.76	15.41	15.23	16.27	19.24	17.74		
1926	Gain--percent.	111.6	112.8	167.4	132.7	85.7	122.7	154.9	152.8		
1927	Actual Tuft Area--Sq. dcm.	29.94	30.04	25.37	25.17	30.34	31.47	37.52	35.02	29.75	
1927	Gain--Sq. dcms.	°5.98	°1.54	°5.19	°1.85	5.35	1.94	5.86	5.67	2.81	°Loss
1927	Gain--percent.	°16.6	°4.9	°48.1	°6.8	6.6	6.2	18.2	19.3	10.4	°Loss
1925	Avg. Area--Sq. dcms.	12.22	11.49	10.45	11.94	12.36	11.36	10.83	12.23		
1926	" " " "	26.44	23.21	21.68	19.32	25.37	21.39	22.04	20.48		
1927	" " " "	32.93	30.81	23.96	26.08	25.66	30.50	34.59	32.19	28.35	
1925	Grams Dry Wt. per Sq. dcm.	9.30	11.27	15.33	22.77	9.46	7.66	10.23	15.29		
1926	" " " " " "	4.45	4.23	4.68	9.35	3.38	2.48	2.65	3.64		
1927	" " " " " "	2.40	2.92	3.01	7.48	3.79	2.46	2.11	3.23		
1925	No. Flower stalks per Sq.dcm.	20.1	22.2	22.5	15.7	41.5	20.7	32.0	16.5		
1926	" " " " " "	30.8	74.8	44.2	23.8	79.8	65.8	55.3	8.7		
1927	" " " " " "	108.6	98.7	60.3	87.1	141.7	87.1	42.9	59.7	13.8	
1925	Avg. Flower Stalk Ht.--cms.				14.2				16.2		
1926	" " " " "				24.0				20.0		
1927	" " " " "				15.2				15.1	17.3	
1925	Avg. leaf length--cms.				9.1				8.2		
1926	" " " "				7.6				7.9		
1927	" " " "				4.5				5.0	5.9	

1925	Growth began July 21	Ended Oct. 17	Period of Growth 88 dys.		Seasonal Precip.		5.96"
1926	" " May 18	" Nov. 9	" " " 175 "		"	"	7.78"
1927	" " July 25	" Oct. 1	" " " 67 "		"	"	7.57"

58

RG
Clipping Study
Black Grama Grass

December 10, 1927

Project: Clipping Study of Black Grama Grass (Bouteloua eriopoda).

Scope: To determine by artificial methods the effect ~~effect~~ of different intensities of use on maintenance of stand and forage production.

Status:

Original series of 4 quadrats to represent moderate utilization established August 1925. Precipitation station established within the enclosure. A second series of 4 quadrats (A series) to represent close utilization was established inside same enclosure at end of growing season 1925. All quadrats are clipped at regular intervals which vary with individual quadrats. Flower stalk counts, height and leaf measurements are made at regular intervals. All quadrats are charted at end of growing season. All data for the current year to be computed, compiled, and analyzed at the conclusion of the field season.

Results to date:

The accompanying table is a complete compilation of results to date. The results given cover a period of 3 years in which one exceptionally good year was sandwiched between two years of moderate precipitation. The rate of response to the different intensity of clipping as reflected in gain or loss in quadrat density is the most outstanding feature of the present data. The quadrats of the series which are clipped to 2 inches above the ground respond quickly to favorable conditions and show a slow rate of loss during a less favorable year. The reverse is true in the case of the A series which are clipped to 1 inch above the ground. These quadrats show a lower percent of gain in 1926 and a greater percent of loss in 1927.

Further Work:

Studies to continue as outlined in work plan.

Date of Completion: Indefinite. Project should continue until definite results are obtained.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

BLACK GRAMA CLIPPING STUDY -- SUMMARY OF DATA

Year:	Quadrat No.	1	2	3	4	1A	2A	3A	4A	
	Clipping Intervals	2wks	4 wks	6 wks	end of seas.	2 wks	4 wks	6 wks	end of seas.	
	Height of Clipping	2"	2"	2"	2"	1"	1"	1"	1"	
1925	Actual Area-Sq.dcm.	15.32	12.10	10.38	8.35	13.24	12.55	9.60	10.08	
1926	" " " "	24.51	22.63	20.49	17.66	16.98	14.94	13.91	8.01	
1925	Gain--Sq. dcms.	9.19	10.53	10.11	9.31	3.74	2.39	4.31	2.07°	°Loss
1926	Gain--Percent.	60.0	87.0	97.4	106.5	28.2	19.0	44.9	20.5°	°Loss
1927	Actual Area--Sq.dcms.	22.76	21.53	17.92	16.24	13.33	11.03	9.59	5.95	
1927	Loss- Sq. dcms.	1.75	1.10	2.47	1.42	3.65	3.91	3.32	2.06	
1927	" Percent.	7.1	4.9	11.6	8.0	21.5	26.2	23.1	25.7	
1925	Avg. Area--Sq. dcms.	15.36	12.62	10.57	8.88	°13.24	°12.55	° 9.60	°10.08	°Actual Area
1926	Avg. " " "	19.92	17.36	15.44	13.01	15.11	13.74	11.76	9.05	spring 1926.
1927	" " " "	23.64	22.08	19.20	19.95	15.16	12.99	11.75	6.98	
1925	Grams dry wt. per sq.dcm. °	2.33	4.04	4.82	7.69	--	---	---	---	°Based on Avg.
1926	" " " " " "	3.51	3.56	6.73	7.80	5.21	7.12	6.49	°°7.19	Area.
1927	" " " " " "	1.01	1.08	1.21	1.84	1.47	2.06	1.43	3.30	°°28 cms. utilized by rodents.
1925	No. Flower stalks per Sq.dcm.	419.0	105.0	261.0	113.0		&			
1926	" " " " " "	116.4	102.4	127.1	90.1	116.6	247.9	213.3	75.1	
1927	" " " " " "	66.3	71.6	77.2	121.1	109.8	87.3	108.8	109.6	
1925	Flower Stalk Height-cms.				17.4					
1926	" " " "				18.0				17.1	
1927	" " " "				13.3				14.1	
1925	Avg. leaf length--cms.				7.8					
1926	" " " "				4.0				3--4	
1927	" " " "				4.8				4.5	

1925	Growth began	July 21	Ended Oct. 17	Period of Growth	88dys.	Seas. Precip.	5.96"
1926	" "	May 18	" Nov. 9	" " "	175 "	" "	7.65"
1927	" "	July 25	" Oct. 1	" " "	67 "	" "	5.88"

RG
Snakeweed Study

December 24, 1927

Project: Study of Snakeweed on Black Grama range.

Scope: To determine the outcome of competition between Snakeweed (Gutierrezia sp.) and Black Grama (Bouteloua eriopoda).

Status: Project established in field July 1924. Three one by three meter quadrats laid out in varying densities and stages of snakeweed growth, with Black Grama present. The snakeweed is predominantly Gutierrezia juncea, not Gutierrezia sarothrae, or Gutierrezia sphaerocephala as previously reported. Quadrats charted and snakeweed measurements taken when established and at close of each growing season. Progress reported annually.

As the accompanying table shows, both snakeweed and grama made remarkable gains in density this year. This was undoubtedly due to the extremely favorable moisture conditions of 1926 and 1927 growing seasons. It is quite striking that in spite of the density gains this season, there was no significant increase in number of snakeweed specimens. At the same time, many new firm sets of grama were fixed this year, particularly on Quadrat No. 3, which supported a mature stand of snakeweed when established. Quadrats 1 and 2 also produced an appreciable number of new tufts, but these do not show up in actual figures, because so many of the old tufts were merged in this year's growth.

In 1925, a serious beetle infestation of the snakeweed roots occurred. This year web-producing larvae were observed in the tops of a great number of snakeweed plants. Each larva would bind several stems together with its web.

In spite of the influence of destructive factors on snakeweed, the data indicate that under moderate grazing, Black Grama will eventually be clearly predominant, in the type under investigation.

SNAKEWEED STUDY—SUMMARY OF DATA

Quadrat No. 1—Young Established Stand of Snakeweed

	Grama				Snakeweed				
Year	Tuft Area	% of Area	No. of specs.	% of specs.	Tuft Area	% of Area	No. of Specs.	% of Spec.	Seas. Precip.
1924	840	79.3	154	92.2	219	20.7	13	7.8	1.82
1925	580	89.6	117	95.9	67	10.4	5	4.1	4.01
1926	645	75.6	133	95.0	208	24.4	7	5.0	8.95
1927	1654	71.7	115	95.0	730	28.3	6	5.0	8.31

Quadrat No. 2—Young Unestablished Stand of Snakeweed

	Grama				Snakeweed				
1924	712	78.9	135	94.4	190	21.1	8	5.6	1.82
1925	562	90.5	106	96.4	59	9.5	4	3.6	4.01
1926	1062	78.9	95	93.1	284	21.1	7	6.9	8.95
1927	1771	77.2	97	92.4	524	22.8	8	7.6	8.31

Quadrat No. 3—Mature Established Stand of Snakeweed

	Grama				Snakeweed				
1924	391	39.2	80	68.3	608	60.8	37	31.7	1.82
1925	475	87.3	62	89.9	69	12.7	7	10.1	4.01
1926	652	66.7	56	67.5	325	33.3	27	32.5	8.95
1927	1425	69.4	81	77.9	628	30.6	23	22.1	8.31

Further Work:

Quadrats to be charted and complete records made each year in accordance with the work Plan.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Soapweed Study

November 25, 1927

Project: Growth Study of Soapweed(Yucca elata)

Scope: To determine the growth,habits, characteristics, and rate of growth of Yucca elata.

Status:

This project was established in the field November 15, 1925, and has been carried through two growing seasons in accordance with the 1925 Work Plan. A rain gage was established in 1926. Measurements of plants this year showed a continued growth rate of approximately ½" per year on mature plants. No flower stalks were produced on any of the experimental plants this season, and very few were grown at any place on the entire Reserve.

Further Work

When time and funds permit, this project is to be expanded in accordance with the revised work plan of November 7, 1926.

Date of Completion: Indefinite.

Assignment: Jornada Range Experiment Station

R. S. Campbell

RG
Plant Identification
Jornada

December 23, 1927

Project: Plant Collections

Scope: To accomplish a survey of the flora of the Jornada and to secure economic data for all species collected.

Status:

Fifteen plant collections have been made on the Reserve, fourteen of which have been identified.

The Fourteenth Collection, made in 1926 consisted of 39 specimens: One grass, 23 non grass-like, and fifteen trees and shrubs. Of these the following seventeen are first Forest Service (or else RG) records:

Non grass-like
Abronia angustifolia
Amsonia arenaria
Cucurbita foetidissima--New genius to F.S.records.
Dipetalia linifolia--New genius to F.S. records.
Lavauxia primiveris
Lepidium lasiocarpum
Sphaeralcea tenuipes

Trees and Shrubs
Agave (sp.)--New genius to F.S. records
Coryphantha macromeris
Dasylirion wheeleri--New genius to F.S. records.
Fouquieria splendens--New genius to F.S. records.
Morus alba
Nolina greenei
Opuntia ballii
Phoradendron macrophyllum
Salix goodingii
Tamarix gallica

The fifteenth Jornada collection, made in 1927, is as yet unidentified.

Further Work:

Plant collections and economic notes to be secured each year.

Date of Completion:

Continuous

Assignment: Jornada Range Experiment Station

Campbell and Canfield.

RG
Carrying Capacity

December 24, 1927

Project: Carrying Capacity of semi-desert range in South Central New Mexico.

Scope: To determine: The grazing capacity of semi-arid range in South Central New Mexico, under different systems of management. To investigate the various affecting factors and their influence on grazing capacity.

Status: Detailed pasture records, including forage crop, utilization, and condition of stock, have been kept on all pastures since 1915. Original reconnaissance of the Mesa pastures made in 1916, was checked in 1923. Results of project from 1915 to 1919 were published in U.S.D.A. Bulletins 588 and 1031. Progress reports to and including 1926. Changes in pasture fences begun 1926. Work Plan revised 1927. Analysis of four years' data in manuscript form prepared this year by Schoeller. Outstanding results of the project to date are included in the discussion on pages 19 to 34 of this report.

Four new forage crop enclosures were built this year.

Further Work:

Investigations to be continued in accordance with revised work plan. Schoeller's manuscript to be revised by Chapline on basis of ten years' data and published as a Departmental Bulletin. When added personnel is available, a new reconnaissance is to be made of the entire Reserve. Investigations to be conducted for placing forage crop estimates on a more sound basis.

Date of Completion: Continuous

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Palatability and Utilization

December 24, 1927

Project: Palatability and utilization study of important forage plants on the Reserve.

Scope: To determine: The relative palatability and proper degree of utilization of important forage plants and to secure detailed life-history information for the species under observation.

Status: Notes were taken at regular intervals during the 1927 growing season on two acre plots, and at the Period Study. One new mixed grass plot was established.

Further Work:

Study to be continued as outlined in working plan, except that the plots will be cut to one quarter acre in size. This will permit a more intensive examination than was possible with the larger plots. New plots to be established as they become necessary for adequate collection of data.

Date of Completion:

Indefinite

Assignment:

Jornada Range Experiment Station, Campbell and Canfield.

RC
Rodent Control
(Cooperation U.S.Biological Survey)

December 24, 1927

Project: Eradication and control of range destroying rodents.

Scope: To accomplish the eradication and control of range destroying rodents, so as to prevent a reduction in carrying capacity from this cause.

Status: Treatment of prairie dogs by U. S. Biological Survey in 1923 resulted in eradication.

The Biological Survey covered 78,000 acres in a treatment of kangaroo rats at a cost of 1.93¢ per acre in 1924. Treatment reduced numbers of rats but did not accomplish eradication. In 1925 a more intensive treatment was made over 45,000 acres at a cost of 4¢ per acre. The work was not continued this year due to lack of funds, so that kangaroo rats and other rodents are still very serious problems at the Station.

Further Work:

In view of the injury that is still being done by range destroying rodents, estimates and recommendations have been made for treatment of the entire Mesa portion of the Reserve, and for controlling the area after eradication. In case no further treatment is available from the Biological Survey, the poisoning of rodents on a small scale at odd times by the Station personnel will be continued.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Handling Stock
Calf Crop

December 24, 1927

Project: Increasing Calf Crops in the Southwest.

Scope: To develop a method of handling stock (the breeding herd) which will increase the calf crop and reduce the cost of production.

Status: Complete records have been kept of all calf crops on the Jornada from 1916 to date. The best available estimates for calf crops in South Central New Mexico have been recorded for the same period. A comparison of the results are included under the discussion of handling stock. The chief limiting factors governing the calf crop have been found to be overstocking of the range, poor condition of the breeding herd, and insufficient numbers and improper distribution of bulls. The methods used on the Jornada to increase the calf crop are as follows: The breeding herd is kept in good condition; conservative stocking of the range; a systematic culling of old bulls and old and barren cows, and their replacement by young, well bred, vigorous animals. The use of pure-bred bulls and high grade cows has resulted in the production of a calf crop of such high quality as to top the market in this region. The average calf crop for similar ranges in this region is estimated at 50.9% for a period of nine years. The Jornada calf crop is 74.1% for the same period, which is 23.2% higher. The bulls are distributed throughout the herd during the breeding season of six months, which usually begins June 1 and ends December 1 of the same year. For the rest of the year the bulls are segregated in one of the best grama grass pastures. Four to five bulls per one hundred cows has proved to be a satisfactory number when properly distributed.

Further Work:

Project to be carried on with the further increase in calf production as the objective.

Date of Completion:

Continuous

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

HG
Handling Stock
Losses

December 24, 1927

Project: Management to avoid loss.

Scope: To develop methods that will result in the elimination or reduction of stock losses from all causes.

Status: Complete records have been kept on the Jornada of all losses since 1915. Similar data has been and is kept of the estimated loss on ranges of this region. With the exception of a few cows which have an infection of cancer in the eye, the Jornada herd has been free from disease. Lightning is the greatest source of unavoidable loss. The loss from poisonous plants is restricted to a few cases of loco poisoning which occur in the spring. More serious losses which may be caused by poison occur during September and October. This source of loss has not been as yet determined. No loss caused by predatory animals has been reported recently.

Losses on the Jornada for the past grazing year were 2.3%. On outside ranges for the same period they were estimated to be between four and five percent. The greatest source of loss in this region is starvation in time of drought. Loss from this cause is eliminated on the Jornada by conservative stocking of the range and by a systematic culling of old animals. Losses from blackleg are prevented by vaccination of all calves at time of branding. Screw worms are a frequent source of trouble, but no losses from this cause have occurred.

Further Work: Project will be carried on with the elimination of all loss from preventable sources as the objective.

Date of Completion: Continuous

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Predatory Animal Control
(Cooperation--U.S.Biological Survey)

December 24, 1927

Project: The eradication and control of predatory animals.

Scope: To prevent the loss of stock and the destruction of game birds and animals by predatory animals.

Status: The U. S. Biological Survey has conducted a systematic campaign of eradication against coyotes and wolves on the Jornada Range Reserve. The methods used have been trapping and poisoning. Poisoning was accomplished by distributing Strychnine in baits made up of the poison and unsalted beef or pork fat. These "baits" were distributed at or near watering places in the various pastures. During a period of operations covering four weeks in February 1927, John F. Moyer, Project Foreman, reported a catch of 78 coyotes. During October 1927, Mr. Moyer by similar methods made a catch of 48 coyotes between the dates of October 15 and November 5, 1927. During both periods, the kill was much larger than reported, since many dead coyotes were found later that were not included in the Project Foreman's report. Rats and Crows appear to be the greatest hindrance to effective poisoning.

Further Work:

The project will be carried on at such subsequent intervals of time as appears to be necessary in the prevention of losses to stock and game.

Date of Completion:

Indefinite.

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Improvement
in Grade

December 24, 1927

Project: Management to improve the general grade of cattle in the Southwest.

Scope: To determine the most practical methods for the improvement in grade of the range cattle of the Southwest. The object of the study is to develop the best methods of producing cattle that will command top prices on the market.

Status: This study has been continuous since 1915. Improved methods of handling stock have been adopted for the purpose of improving the breeding herd and its product. During this period the following observations have been made: Range bred animals are more hardy than animals imported from less severe environments; pure-bred bulls are an essential part of the herd and they should be maintained in prime condition at all times; cows usually breed in poorer condition than bulls. A systematic culling of old and below-standard animals is essential. Culls are replaced with selected heifers from the Jornada herd and pure-bred bulls obtained by purchase. Since 1916 the Jornada calves have on the average excelled in quality, weight, and selling price. This year a lot of 52 selected heifers were sold to the New Mexico State College to be used for experimental purposes, at a price of $40.30 per head. All other calves of both sexes have been sold at 9¢ per pound.

Further Work:

Project to be continued as specified in the Cooperative Agreement and work plan. Bulls to be segregated except during the period June 1 to December 1. Replacement heifers not to be bred until past 18 months of age.

Date of Completion:

Continuous

Assignment: Jornada Range Experiment Station, Campbell and Canfield.

RG
Handling Stock
Costs

December 26, 1927

Project: Cost of Cattle Production.

Scope: To determine the relative cost of producing cattle under pasture and improved methods of management, as compared with the cost on open range.

Status: Schoeller's analysis of the cost of operation on the Jornada was worked up and published under the title "The Cost of a Range Calf", in the October issue of the "Producer". It was shown that the calf crop is the greatest single factor influencing the cost of production.

Further Work:

Cost data on various phases of the work to be kept for Jornada operation, and similar data to be secured from adjoining ranges in so far as possible.

Date of Completion:

Continuous

Assignment: Jornada Range Experiment Station, Campbell and Canfield.